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Influential factors in recruitment and increase of the members of Majma Hamyari cultural plan during Iran's economic sanctions and post-sanction, using fuzzy EDAS method

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Abstract

n this paper, a new approach for decision-making and marketing forecast based on fuzzy logic fuzzy expert system is presented regarding the tourism development plan of the Majma Hamiyari Association by Abbas Bashiri. In other words, let's look at system marketing using the reverse fund design calculation method in attracting different strata according to the input and output variables. In fact, we offer the marketing manager a plan to focus the most time and capital for advertising on the segment where this calculation method has the greatest impact on attracting customers. This study suggests an infrastructure for determining the factors affecting tourism. Hence, the newest multi-criteria decision-making method, the fuzzy best-worst method was used to calculate the relative importance of indices and fuzzy evaluation based on distance from average solution technique was applied as a multi-attribute decision-making method to rank effective factors in tourism. The statistical population of this research consists of directors and experts in the tourism industry in Mazandaran. Due to the results of this study, providing Banking facilities to users ranks first among other options for the economy itself.

Keywords: Majma Hamyari cultural plan, Fuzzy best worst method, Fuzzy EDAS method, Fuzzy expert system, Multi-criteria decision-making
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1 Introduction

A reflection on our country's macro policies in the field of culture and economy confirms that these two categories are so intertwined and inseparable that if we claim that these two are the fabric of a society's identity and its driving force, we are not exaggerating. Therefore, a special look at cultural issues with an economic approach (economy of culture) and infusing cultural spirit into economic issues (culture of economy) has always been one of the requirements for realizing the strategic goals of our country.

Undoubtedly, studying the experiences and lessons learned in different climates has optimized production and is a guarantee for sustainable development, reconciliation and establishing peace, and knowing the cultural and artistic

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roots of each land and their evolution throughout history and everywhere in the world, to our awareness and respect for It adds other nations and cultures.

Respecting native values with the aim of raising the public's awareness of the great dangers that threaten the future generation should be able to help producers, designers, sellers and merchants to step and take a decision with open eyes and a very sensitive responsibility, because design and the production of cultural goods and services is not just the design and production of a product, but the design of an intellectual and cultural policy at the national level and will shape a generation that will be the guardian of Iran's heritage.

The increasing growth of cultural products in terms of identity and economy of the world has turned the cultural product into a strategic product, which has been the attention of governments and governments.

With a quick look at macro policies, it can be clearly seen that simultaneous and maximum attention to cultural and economic issues has been one of the priorities in all governments, which confirms the serious responsibility of cultural and economic institutions in optimal planning in order to realize cultural development.

But the question may arise as to how cultural development is defined and why cultural industries, which include useful and practical cultural goods and services produced by members of society to meet the cultural needs of society, in our country, despite its role in economic growth and job creation. So far, it has not been given serious attention by cultural officials and managers, and what are the obstacles to its growth and development in Iran? To answer this question, the following can be mentioned:

The first obstacle to cultural development in Iran is the economic obstacle. In our country, the culture sector is not considered as a productive sector of the economy and a wealth producing institution, and this sector is only seen as a cost center, in other words, cultural industries are not considered as an industry. Also, most managers of cultural institutions have little information about the commercial and economic capabilities of cultural industries, and for this reason, they do not see their work as economic or in the field of economics, and they often want government support.

Another economic challenge is the quantitative and qualitative expansion of cultural industries worldwide. In fact, the cultural products of our country have entered into fierce global competition. The leading countries in the field of cultural industries have many facilities, and also with the globalization of the economy and the emergence of internet networks, the possibility of supply and exchange, or in other words, access to cultural products around the world, has become easy and fast, and the time and place limits of access to the market cultural industries have decreased a lot. In this way, competition has become difficult for producers and suppliers of cultural products and services in our country.

Another obstacle to the growth of cultural industries is cultural obstacles. Because of its soft nature, cultural industries are generally seen in the background of hard industries. For this reason, an important role is not given to cultural industries in the economic development of the country. Also, different branches of cultural industries are often considered as separate and independent branches that are not considered an important part of economy and industry.

Despite all the challenges and cases mentioned, when it comes to development and progress, national wealth creation and job creation, it is necessary that the participation and cooperation of institutions in charge of culture, whether public or private, is fully highlighted and the government by creating a suitable platform and universal support for the private sector should provide the possibility of attracting and growing creative and innovative projects so that the private sector can become a producer of wealth in the cultural sector of the country.
The expansion of cultural businesses has become a necessity in today's society, and today, by using domestic capacities and planning in this field through cultural businesses, along with entrepreneurship and job creation, a step should be taken in the direction of economic and cultural prosperity.

The World Organization of UNESCO, which declared 1987-1997 as the World Decade of Cultural Development, has declared cultural development as follows: The development and progress of the cultural life of a society with the aim of realizing cultural values, in a way that is coordinated with the general state of economic and social development. But among the issues that play a significant role in cultural development are cultural industries (cultural goods and services) that cover all cultural, economic, and social dimensions and intercultural communication, which is the best model for a globalized citizen. It has also become a tool for peace and dialogue between civilizations.

In order to achieve development, dynamism, vitality, maintaining and deepening its physical and mental health, every society needs the participation of all members of the society, even rural women and men who lack literacy in cultural and social affairs, therefore, for cultural development, the motivations for participation must be increase and strengthen them, since the governments are responsible for the development policy of the society, therefore they monitor its implementation by organizations, because cultural development is possible through the participation of people, intermediaries and agents who are in direct contact with the people's groups. Thus, the formation of powerful non-governmental organizations and organizations that can attract audiences with integrated management and coordinated planning and have the ability to gather their audiences together and document cultural affairs with people's participation is one of the most accessible methods of injecting dynamism. Vitality and movement to the body of the society, which of course is important, is possible only with the spiritual support of the government and the removal of obstacles to the growth of these organizations, and the attention of these organizations and service organizations to the growth of quality and customer satisfaction can play an important role in the growth of cultural industries and the cultural and economic development of countries.

But due to the intensification of competition in all areas of business, marketing science is also very welcome and in fact it is an ocean composed of efficient sciences of the business world that has a significant impact on the success or failure of economic enterprises. Independent cultural institutions have also come to the conclusion that the realization of the profitability of cultural industries is dependent on the understanding and implementation of marketing mechanisms, and companies can succeed in this field if they can use a new and attractive method in the science of marketing to sell the products of cultural industries and attract people's participation in provide cultural affairs and these solutions should be in line with the slogan of UNESCO's global organization. "Development and progress do not take place in any field except with the creation of cultural infrastructures and people's participation" so it can be clearly seen the bold role of these companies in guaranteeing the sales market of cultural industries products, which is one of the infrastructures of cultural development.

In our country, the investment of the private sector in cultural affairs is very low, and one of the characteristics of private organizations is that they do not rely on the resources of government budgets and the prosperity of the cultural and economic sector of the country through the attraction of capital and human resources. It is possible to refer to the Hamiyari Mehr Iranian Descendants Cultural and Artistic Institute under the registration number 1240, National ID 14006446404 and the Iranian Descendants Hamiyari Cultural and Artistic Institute under the registration number 684, National ID 10760376341 as two non-governmental centers and private organizations that look to new horizons and aim to create motivating and removing barriers to people's participation in cultural affairs, by combining mathematics and marketing and presenting an innovative method, Hamiyari Assembly's cultural plan with intellectual property registration number 10062 (Abbas Bashiri) and license numbers 136/307724, 17/1237 and 136/176516 as an operational model and has presented a special look at cultural issues with an economic approach (culture economy) so that in this way, it is accompanied by the government, whose mission is to encourage entrepreneurs and remove obstacles with the aim of development and employment, and to be able to produce technology in this field.

In order to benefit from the excitement and vitality caused by the period and the participation of people, Hamiyari Aindigan Institute investigated life insurances, clubs and family financial funds, and by removing the weaknesses and obstacles to people's participation in these systems, it formed a wide social network on the website. Application or channel named "Cultural Plan of Hamiyari Assembly" and by fixing the deficiencies of family funds and life insurances. This project is formed from various cultural clubs that people can become a member of one of these clubs according to their financial ability and benefit from the services of these clubs for several years. In this club, a form of "reverse fund" named "Majma Hamiyari" has been designed, which collects monthly sums, but the main difference between this reverse fund and lending funds is as follows: the sums that the winners receive in the lottery are no longer in the form of loans that have to be repaid, rather, it is in the form of a prize or a free loan in the form of cash gifts for the purchase of cultural industry products. In addition, the winner not only does not need to repay the loan from the following month, but can use other club services without paying a monthly subscription fee and for free until the end of the plan. to do with such a special financial design in this reverse fund, there is no need for a bank loan guarantee, and no need for people to necessarily know each other like a family fund to guarantee repayment. Solving the above concern has enabled the institution to reach out to different classes by using people's participation and creating an atmosphere full of excitement and joy, and to support the cultural economy and put the cost of cultural affairs in the households' baskets.

In these clubs, a system of financial management has been designed and implemented, in which the monthly membership fee of the club members is entered into complex and precise calculations, which have been approved by the country's official expert in the financial and economic field. In fact, this special financial model not only makes all the members of the club can get back their paid subscriptions, but they all enjoy various cultural packages and the purchase of cultural industries products for free. In addition, this financial model creates a healthy and new cycle in the cultural economy by investing in the country's safe systems such as the teacher insurance system and spending in the cultural sector. This project has been able to display a high level of technology in terms of combining free virtual and in-person services. This complex combination of face-to-face cultural-welfare services (cultural industries, conferences, festivals, educational workshops, welfare services, etc.) and virtual services (financial management system, virtual training courses in various fields, and holding online contests with cultural topics) has made this club resilient in the most difficult economic and social conditions.

By presenting a new method of allocating approximately eighty percent of club members' subscription rights to awards and creating credit and insurance supports, Hamiyari Ayandag Institute has implemented incentive policies in such a way that the members of each club, while receiving all their paid subscriptions, succeed for free. The purchase of valuable products of cultural industries, cash gifts and other cultural and welfare services are received.

It is worth mentioning that this innovation was conceptualized and implemented by experts in the field of IT, mathematics, programming, accounting and sustainability science, whose profiles are available in the creative and knowledge-based system of the scientific vice president of technology. There are more than 50 different types of clubs in the cultural plan of the Hamiyar Assembly, and the chart of how one of these clubs, which is the Hamiyar Club, works, is shown below Figure 1:

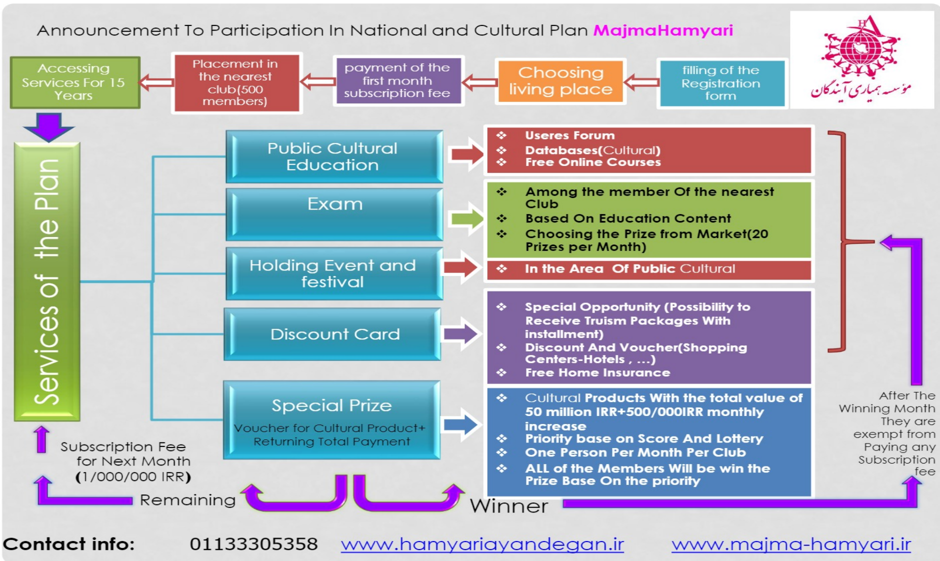

Figure 1: Announcement to participation in tourism development plan Majma Hamyari

Table 1: Data and influential factors in Hamiyar club

Month	Special Prize	Cost	Monthly Balance	Total Balance	Rate	Finacial
1	10000000	300000000	54000000	54000000	1.013	4936000000
2	10300000	29940000	53560000	108262000	1.013	-5021138000
3	10600000	29880000	53120000	162789000	1.013	-5105410594
4	10900000	29820000	52680000	217585000	1.013	-5188814332
5	11200000	29760000	52240000	272654000	1.013	-5271345718
6	11500000	29700000	51800000	327998788	1.013	-5353001212
7	11800000	29640000	513600000	383622772	1.013	-5433777228
8	12100000	29580000	50920000	439529868	1.013	-5513670132
⋮	⋮	⋮	⋮	⋮	⋮	⋮
177	62800000	19440000	-23440000	19691055293	1.013	-593344707
178	63100000	19380000	23880000	19923159000	1.013	-395040988
179	63400000	19320000	-24320000	20157840079	1.013	-193559921
180	63700000	19260000	-24760000	20395132	1.013	11132000

The following calculations can be made from the data in Table 1:

Special prize (A special prize given to the winner of the lottery in the month)= 10,000,000 Toman + (300,000)$\times$n,

Special prize= returning total payment + [10,000,000+ (n$\times$100,000)].

For instance, if someone who pays 200,000 Toman monthly, wins the special prize in the 20th month of the plan:

Special prize= 10,000,000 Toman + (300,000)$\times$20=16,000,000.

Special prize= 20$\times$200,000 + [10,000,000+ (20$\times$100,000)].

where

Caltural prize: The total money dedicated to the winners of the cultural exam in each month.

Special prize: A special prize given to the winner of the lottery in the month.

Cost: Total expenses for executing the plan.

Monthly balance: The amount of money held in the account for this month.

Total balance: Total amount of money in the account (interest rate considered).

Rate: Interest Rate.

Financial justification: This value shows the number of months the plan has to be run to have financial justification. This value has to be positive for financial justification.

But as we have mentioned, considering the competitive environment prevailing in today's market and companies' use of marketing science to progress in their work, in this article we want to look at the factors affecting the attraction and expansion of users of Hamiyari Forum's cultural plan during the embargo period and after the economic embargo (from 2018) using best and worst fuzzy weighting method and evaluation based on distance from average solution (EDAS) technique. In fact, we want to give output to the marketing manager of the plan to focus the most time and capital on which criteria for improvement, so that this new method of calculation (reverse fund) has the greatest effect in attracting them.

In the real-world problems, we are likely confronted with some alternatives that need to be evaluated with respect to multiple conflicting criteria. Multi-criteria decision-making (MCDM) refers to making decisions in such a situation [14, 16, 17, 18]. There are many methods and techniques available for solving MCDM problems [1, 2]. Therefore, fuzzy MCDM methods and techniques are very useful to deal with this problem. Many researchers have studied supplier selection problem using fuzzy set theory. Ullah et al. [27] proposed multi-criteria decision-making model for optimal planning of on/off grid hybrid solar, wind, hydro, biomass clean electricity supply. Vishnupriyan et al. [28] extended multi-criteria decision analysis for optimal planning of desalination plant feasibility in different urban cities in india. Zhang et al. [30] developed a model for evaluation based on distance from average solution method for multiple criteria group decision making under picture 2-tuple linguistic environment. Torkayesh et al. [26] presented a state-of-the-art survey of evaluation based on distance from average solution EDAS: developments and applications. Merdivenci and Karakas [19] developed an analysis of factors affecting health tourism performance using fuzzy DEMATEL method, advances in hospitality and tourism research (AHTR).

The evaluation based on distance from average solution EDAS method is an efficient multi-criteria decision-making method [12, 13]. Because the uncertainty is usually an inevitable part of the MCDM problems, fuzzy MCDM methods can be very useful for dealing with the real-world decision-making problems. In this study, we extend the EDAS method to handle the MCDM problems in the fuzzy environment. A case study of Influential factors in recruitment and increase of the members of Majma Hamyari cultural plan during Iran's economic sanctions and post-sanction in Mazandaran is used to show the procedure of the proposed method and applicability of it. Also, we perform a fuzzy best-worst method [9, 20] by using simulated weights for criteria to examine the stability and validity of the results of the proposed method. The results of this study show that the extended fuzzy EDAS method is efficient and has good stability for solving MCDM problems.

The rest of this paper is organized as follows. In Section 2, we summarize some basic concepts and definitions about the fuzzy set theory and fuzzy best-worst method. In Section 3, an extended EDAS method is presented to deal with MCDM problems under fuzzy environment. In Section 4, we use a case study of tourism industry to illustrate the procedure and application of the fuzzy BWM method. In Section 5, a fuzzy EDAS method is performed to show the validity and stability of the results of the proposed method. The conclusions are discussed in Section 6.

2 preliminaries

In this section, we briefly review the concepts of fuzzy sets [4], triangular fuzzy numbers and the graded mean integration representation (GMIR) [6, 7] of triangular fuzzy numbers. Moreover, we also briefly review the fuzzy BWM [25, 5].

2.1 Fuzzy sets and triangular fuzzy numbers

Definition 2.1. Let $X = \{x_1, x_2, \cdots, x_n\}$ be a finite universe of discourse. A fuzzy set $\tilde{A}$ in X is represented as $\tilde{A} = \{(x_i, \mu_{\tilde{A}}(x_i)) \mid x_i \in X\}$, where $\mu_{\tilde{A}}$ is the membership function of the fuzzy set $\tilde{A}$, $\mu_{\tilde{A}}(x_i)$ denotes the degree of membership of element x_i belonging to $\tilde{A}$ and $\mu_{\tilde{A}}(x_i) \in [0,1]$.

Definition 2.2. A fuzzy number $\tilde{A}$ on R is defined as a triangular fuzzy number (TFN) if its membership function $\mu_{\tilde{A}}(x) : R \to [0,1]$ is equal to

$$\mu_{\tilde{A}}(x) = \begin{cases} 0, & x < l, \\ \frac{x-l}{m-x}, & l \leq x < m, \\ \frac{u-x}{u-m}, & m \leq x \leq u, \\ 0, & x > u, \end{cases} \tag{2.1}$$

where l, m , and u respectively represent the lower, modal, and upper value of the support of $\tilde{A}$, all of which are crisp numbers $(-\infty < l \leq m \leq u < \infty)$. A TFN can be represented as a triplet (l, m, u).

For the basic operational laws of two TFNs, the readers can refer to [23, 24].

Definition 2.3. The graded mean integration representation (GMIR) $R(\tilde{A})$ of a TFN represent the ranking of triangular fuzzy number $\tilde{A} = (l, m, u)$ is defined as follows:

$$R(\tilde{A}) = \frac{1}{6}\left(l + 4m + u\right). \tag{2.2}$$

Definition 2.4. Suppose that $\tilde{A} = (l, m, u)$ be a TFN. A function ψ, is defined in the following to find the maximum between a TFN and zero.

$$\psi(\tilde{A}) = \begin{cases} \tilde{A} & if \quad R(\tilde{A}) > 0, \\ \tilde{0} & if \quad R(\tilde{A}) \leq 0, \end{cases} \tag{2.3}$$

where $\tilde{0} = (0, 0, 0)$.

2.2 Fuzzy best-worst method

Suppose there are n criteria for a research object, and the fuzzy pairwise comparisons on these n criteria can be performed based on the linguistic variables (terms) of decision-makers, such as ‘Equally importance (EI)’, ‘Weakly important (WI)’, ‘Fairly Important (FI)’, ‘Very important (VI)’, and ‘Absolutely important (AI)’. Then, the linguistic evaluations of decision-makers need to be transformed to fuzzy ratings (represented by TFNs), and the rules of transformation are listed in Table 2 [9, 20].

Table 2: Transformation rules of linguistic variables of decision makers

Linguistic terms	Membership function
Equality importance (EI)	(1,1,1)
Weakly Important (WI)	$(\frac{2}{3}, 1, \frac{3}{2})$
Fairly Important (FI)	$(\frac{3}{2}, 2, \frac{5}{2})$
Very Important (VI)	$(\frac{5}{2}, 3, \frac{7}{2})$
Absolutely Important (AI)	$(\frac{7}{2}, 4, \frac{9}{2})$

Then, the fuzzy comparison matrix can be obtained as follows:

$$\begin{array}{ccccc} & C_1 & C_2 & \cdots & C_n \\ C_1 & \tilde{a}_{11} & \tilde{a}_{12} & \cdots & \tilde{a}_{1n} \\ C_2 & \tilde{a}_{21} & \tilde{a}_{22} & \cdots & \tilde{a}_{2n} \\ \vdots & \vdots & \vdots & \dots & \vdots \\ C_n & \tilde{a}_{n1} & \tilde{a}_{n2} & \cdots & \tilde{a}_{nn} \end{array}$$

where $\tilde{a}_{ij}$ represents the relative fuzzy preference of criterion i to criterion j, which is a triangular fuzzy number; $\tilde{a}_{ij} = (1, 1, 1)$ when $i = j$.

A pairwise comparison $\tilde{a}_{ij}$ is defined as a fuzzy reference comparison if i is the best element and/or j is the worst element.
In this paper, we will elaborate the detailed steps of fuzzy BWM for determining the fuzzy weights of criteria. It should be noted that this detailed steps can also be used for the determination of fuzzy weights of alternatives.

Step 1: Decide a set $C = \{C1, C2, \cdots, Cn\}$ of decision criteria.

Step 2: Decide the best (e.g., the most desirable or the most important) criterion C_B and the worst (e.g., the least desirable or the least important) criterion C_W.

Step 3: Decide the preference of the best criterion over all the other criteria using the linguistic terms of decision-makers in Table 1 to obtain the best-to-others vector $\tilde{A}_B = (\tilde{a}_{B1}, \tilde{a}_{B2}, \cdots, \tilde{a}_{Bn})$, where $\tilde{a}_{Bj}$ denotes the preference of the best criterion C_B over criterion $C_j, j = 1, 2, \cdots, n$ and $\tilde{a}_{BB} = (1, 1, 1)$.

Step 4: Decide the preference of all the criteria over the worst criterion using the linguistic evalutions of decision-makers listed in Table 1 to get the fuzzy others-to-worst vector $\tilde{A}_w = (\tilde{a}_{1w}, \tilde{a}_{2w}, \cdots, \tilde{a}_{nw})$, where $\tilde{a}_{jw}$ denotes the preference of the criterion C_j over the worst criterion C_w, j = 1, 2, ..., n and $\tilde{a}_{ww} = (1, 1, 1)$.

Step 5: Get the optimal weight vector $w^* = [\tilde{w}_1^*, \tilde{w}_2^*, \cdots, \tilde{w}_n^*]$, where $\tilde{w}_j^*$ denotes the optimal weight of criterion C_j and $j = 1, 2, \ldots, n$, by constructing the following programming model:

$$\min \ \max_j \left\{ \left| \frac{\tilde{w}_B}{\tilde{w}_j} - \tilde{a}_{Bj} \right|, \left| \frac{\tilde{w}_j}{\tilde{w}_w} - \tilde{a}_{jw} \right| \right\},$$
$$s.t. \begin{cases} \sum_{j=1}^{n} R(\tilde{w}_j) = 1, \\ l_j^w \leq m_j^w \leq u_j^w, \\ l_j^w \geq 0, \\ j = 1, 2, \cdots, n, \end{cases} \tag{2.4}$$

where $\tilde{w}_B = (l_B^w, m_B^w, u_B^w), \tilde{w}_j = (l_j^w, m_j^w, u_j^w), \tilde{w}_w = (l_w^w, m_w^w, u_w^w), \tilde{a}_{Bj} = (l_{Bj}, m_{Bj}, u_{Bj})$, and $\tilde{a}_{jw} = (l_{jw}, m_{jw}, u_{jw})$. Eq. (2.4) can be transferred to the following nonlinearly constrained optimization problem:

$$\min \ \tilde{\xi}$$
$$\text{s.t.} \begin{cases} \left| \frac{\tilde{w}_B}{\tilde{w}_j} - \tilde{a}_{Bj} \right| \leq \tilde{\xi} \\ \left| \frac{\tilde{w}_j}{\tilde{w}_w} - \tilde{a}_{jw} \right| \leq \tilde{\xi} \\ \sum_{j=1}^{n} R(\tilde{w}_j) = 1 \\ l_j^w \leq m_j^w \leq u_j^w \\ l_j^w \geq 0 \\ j = 1, 2, \cdots, n, \end{cases} \tag{2.5}$$

where $\tilde{\xi} = (l^\xi, m^\xi, u^\xi)$. Considering $l^\xi \leq m^\xi \leq u^\xi$, we suppose $\tilde{\xi}^* = (k^*, k^*, k^*)$ and $k^* \leq l^\xi$, then Eq. (2.5) can be transferred as:

$$\min \ \tilde{\xi}^*$$
$$\text{s.t.} \begin{cases} \left| \frac{(l_B^w, m_B^w, u_B^w)}{l_j^w, m_j^w, u_j^w} - (l_{Bj}, m_{Bj}, u_{Bj}) \right| \leq (K^\star, k^\star, k^\star) \\ \left| \frac{(l_j^w, m_j^w, u_j^w)}{l_w^w, m_w^w, u_w^w} - (l_{jw}, m_{jw}, u_{jw}) \right| \leq (K^\star, k^\star, k^\star) \\ \sum_{j=1}^{n} R(\tilde{w}_j) = 1 \\ l_j^w \leq m_j^w \leq u_j^w \\ l_j^w \geq 0 \\ j = 1, 2, \cdots, n. \end{cases} \tag{2.6}$$

By solving Eq. (2.6), the optimal fuzzy weights $(\tilde{w}_1^*, \tilde{w}_2^*, \cdots, \tilde{w}_n^*)$ and $\tilde{\xi}^*$ can be obtained.

3 New Method of Evaluation Based on EDAS

In this section, we propose a new multi-criteria decision-making method that is called fuzzy EDAS. This method is very useful when we have some conflicting criteria. In the compromise MCDM methods the best alternative is obtained by calculating the distance from ideal and nadir solutions. The desirable alternative has lower distance from ideal solution and higher distance from nadir solution in these MCDM methods. However, the best alternative in the proposed method is related to the distance from average solution (AV). We don't need to calculate the ideal and the nadir solution in the proposed method. In this method, we have two measures dealing with the desirability of the alternatives. The first measure is the positive distance from average (PDA), and the second is the negative distance from average (NDA). These measures can show the difference between each solution (alternative) and the average solution. The evaluation of the alternatives is made according to higher values of PDA and lower values of NDA. Higher values of PDA and/or lower values of NDA represent that the solution (alternative) is better than average solution.

Suppose that we have a set of n alternatives $A = \{A_1, A_2, \cdots, A_n\}$, a set of m criteria $C = \{C_1, C_2, \cdots, C_m\}$ and k decision-makers $C = \{C_1, C_2, \cdots, C_k\}$. The steps for using the proposed method are presented as follows [3, 11, 22]:

Step 1: Construct the average decision matrix (X), shown as follows:

$$X = [\tilde{x}_{ij}]_{n\times m} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ \tilde{x}_{n1} & \tilde{x}_{n2} & \cdots & \tilde{x}_{nn} \end{bmatrix}, \tag{3.1}$$

such that

$$\tilde{x}_{ij} = \frac{1}{k}\sum_{p=1}^{k} \tilde{x}_{ij}^{p}, \tag{3.2}$$

where $\tilde{x}_{ij}^{p}$ denotes the performance value of alternative A_i $(1 \le i \le n)$ with respect to criterion C_j $(1 \le j \le m)$ assigned by the pth decision-maker $(1 \le p \le k)$.

Step 2: Construct the matrix of criteria weights, shown as follows:

$$W = [\tilde{w}_j]_{1\times m}, \tag{3.3}$$

such that

$$\tilde{w}_j = \frac{1}{k}\sum_{p=1}^{k} \tilde{w}_j^{p}, \tag{3.4}$$

where $\tilde{w}_j^{p}$ denotes the weight of criterion C_j $(1 \le j \le m)$ assigned by the pth decision-maker $(1 \le p \le k)$.

Step 3: A fuzzy average decision matrix is developed with respect to all the criteria considered using Table 3 and bellow equation:

$$AV = [\widetilde{av}_j]_{1\times m}, \tag{3.5}$$

such that

$$\widetilde{av}_j = \frac{1}{n}\sum_{i=1}^{n} \tilde{x}_{ij}. \tag{3.6}$$

The elements of this matrix $\widetilde{av}_j$ represents the average solutions with respect to each criterion. Therefore, the dimension of the matrix is equal to the dimension of criteria weights matrix.

Step 4: Suppose that B is the set of beneficial criteria and N is the set of non-beneficial criteria. In this step the matrices of positive distance from average (PDA) and negative distance from average (NDA) are calculated according to the type of criteria (beneficial and non-beneficial), shown as follows:

$$PDA = [\widetilde{pda}_{ij}]_{n\times m}, \tag{3.7}$$

$$NDA = [\widetilde{nda}_{ij}]_{n\times m}, \tag{3.8}$$

Table 3: Linguistic terms for alternatives ratings.

Linguistic terms	Membership function
Very low (VL)	(0,0,0.1)
Medium low (ML)	(0,0.1,0.3)
Low (L)	(0.1,0.3,0.5)
Medium (M)	(0.3,0.5,0.75)
High (H)	(0.5,0.75,0.9)
Medium high (MH)	(0.75,0.9,1)
Very high (VH)	(0.9,1,1)

where

$$\widetilde{pda}_{ij} = \begin{cases} \dfrac{\psi(\tilde{x}_{ij} - \widetilde{av}_j)}{R(\widetilde{av}_j)}, & if\ j \in B, \\ \dfrac{\psi(\widetilde{av}_j - \tilde{x}_{ij})}{R(\widetilde{av}_j)}, & if\ j \in N, \end{cases} \tag{3.9}$$

$$\widetilde{nda}_{ij} = \begin{cases} \dfrac{\psi(\widetilde{av}_j - \tilde{x}_{ij})}{R(\widetilde{av}_j)}, & if\ j \in B, \\ \dfrac{\psi(\tilde{x}_{ij} - \widetilde{av}_j)}{R(\widetilde{av}_j)}, & if\ j \in N, \end{cases} \tag{3.10}$$

where $\widetilde{pda}_{ij}$ and $\widetilde{nda}_{ij}$ denote the positive and negative distance of performance value of ith alternative from the average solution in terms of jth criterion, respectively.

Step 5: Calculate the weighted sum of positive and negative distances for all alternatives, shown as follows:

$$\widetilde{sp}_i = \sum_{j=1}^{m} \tilde{w}_j \widetilde{pda}_{ij}, \tag{3.11}$$

$$\widetilde{sn}_i = \sum_{j=1}^{m} \tilde{w}_j \widetilde{nda}_{ij}. \tag{3.12}$$

Step 6: The normalize values of $\widetilde{sp}_i$ and $\widetilde{sn}_i$ for all alternatives are calculated as follows:

$$\widetilde{nsp}_i = \frac{\widetilde{sp}_i}{\max_i(R(\widetilde{sp}_i))}, \tag{3.13}$$

$$\widetilde{nsn}_i = 1 - \frac{\widetilde{sn}_i}{\max_i(R(\widetilde{sn}_i))}. \tag{3.14}$$

Step 7: Calculate the appraisal score $(\widetilde{as}_i)$ for all alternatives, shown as follows:

$$\widetilde{as}_i = \frac{1}{2}(\widetilde{nsp}_i + \widetilde{nsn}_i). \tag{3.15}$$

Step 8: Rank the alternatives according to the decreasing values of appraisal scores $(\tilde{as}_i)$. In other words, the alternative with the highest appraisal score is the best choice among the candidate alternatives.

4 Findings

Influential factors in recruitment and increase of the members of Majma Hamyari cultural plan during Iran's economic sanctions and post-sanction in Iran as well as Mazandarn that has developed and expanded rapidly in recent years and is used as a tool for regional and national development, both as well as the growth potential of the sector and many other industries. In the implementation of this study, the evaluation of criteria to determine performance of increase of the members of Majma Hamyari cultural plan was carried out. Aim of the study is to determine the cause and effect criteria by revealing the extent of the relationship between the fuzzy best-worst MCDM method and EDAS. In this part, ten practical cases are selected for the application and verification of the proposed fuzzy BWM. During the implementation, evaluations of an expert group of decision-makers in health tourism of the tourism sector were taken as a basis.

Step 1: These criteria are listed as follows:

reverse fund (C_1): Using a new economic method called the reverse fund in the cultural plan.

online lottery (C_2): Providing online lottery and putting the lottery video on the site.

Online competitions (C_3): The possibility of participating in online cultural competitions at all hours of the day and night every month.

Education Courses (C_4): Establishing general culture training courses (for all cultures and ethnicities in subjects such as historical, legal, ethnic, social) regardless of the geographical border of the provinces.

patronage (C_5): Creating credit and insurance supports.

Services (C_6): Providing cultural services in a virtual format.

Conference (C_7): Establishing a conference in each province with the benefit of artists, elites, cultural experts and other capacities of that province.

Membership fee (C_8): Return of members' membership fees.

reward (C_9): Preservation of financial interests of users in case of withdrawal.

Production of educational content (C_{10}): The possibility of users benefiting from 50 Percent of the cultural and welfare facilities of the plan if they do not pay the membership fee.

Welfare Services (C_{11}): Donation of products of domestic cultural industries as a part of members' prize.

Employment (C_{12}): Producing educational content and holding online contests on national occasions and celebrations.

Localization (C_{13}): Providing welfare services to plan members.

Financial interests (C_{14}): The impact of project implementation on job creation in each region.

User benefit (C_{15}): The possibility of placement of natives of each region in each club.

In this study, criteria were acquired from the literature and reviewed by a team of experts in order to apply them to influential factors in recruitment and increase of the members of Majma Hamyari cultural plan during Iran's economic sanctions and post-sanction, and necessary additions were made. Study was held with 15 experts within the scope of the research.

Step 2: The reverse fund ($C1$) and Membership fee ($C8$) are respectively the best and the worst criterion based on the opinions from the company.

Step 3: The fuzzy reference comparisons are performed, and the linguistic terms of decision-maker for fuzzy preferences of the best criterion over all the criteria are listed in Table 4. Then, the fuzzy best-to-others vector can be obtained according to Table 2 as follows:

Table 4: The cumulative decision matrix.

Criteria	C_1	C_2	C_3	C_4	C_5
$\tilde{A}_B$	(1,1,1)	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{2}{3},1,\frac{3}{2})$
Best criterion C_1	EI	WI	WI	VI	WI
Criteria	C_6	C_7	C_8	C_9	C_{10}
$\tilde{A}_B$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{7}{2},4,\frac{9}{2})$	$(\frac{3}{2},2,\frac{5}{2})$
Best criterion C_1	WI	VI	VI	AI	FI
Criteria	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
$\tilde{A}_B$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{5}{3},3,\frac{7}{2})$	$(\frac{7}{2},4,\frac{9}{2})$	$(\frac{3}{2},2,\frac{5}{2})$
Best criterion C_1	WI	WI	VI	AI	FI

Step 4: The fuzzy reference comparisons for the worst criterion are executed, and the linguistic evaluations of

decision-makers for the fuzzy preferences of all the criteria over the worst criterion are listed in Table 5. Then, the fuzzy others-to-worst vector can be obtained according to Table 2 and as follows:

Table 5: The cumulative decision matrix.

Criteria	C_1	C_2	C_3	C_4	C_5
$\tilde{A}_w$	$(\frac{7}{2},4,\frac{9}{2})$	$(\frac{5}{2},3,\frac{9}{2})$	$(\frac{5}{2},3,\frac{9}{2})$	$(\frac{3}{2},2,\frac{5}{2})$	$(\frac{2}{3},1,\frac{3}{2})$
Worst criterion C_8	AI	Vi	VI	FI	WI
Criteria	C_6	C_7	C_8	C_9	C_{10}
$\tilde{A}_w$	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{2}{3},1,\frac{3}{2})$	(1,1,1)	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{3}{2},2,\frac{5}{2})$
Worst criterion C_8	VI	WI	EI	VI	FI
Criteria	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
$\tilde{A}_w$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{2}{3},1,\frac{3}{2})$	$(\frac{5}{2},3,\frac{7}{2})$	$(\frac{3}{2},2,\frac{5}{2})$	$(\frac{5}{2},3,\frac{7}{2})$
Worst criterion C_8	WI	WI	VI	FI	VI

Step 5: Based on the above analysis, for getting the optimal fuzzy weights of all the criteria, the following nonlinearly constrained optimization problem can be built according to Eq. (2.6).

$$
\begin{aligned}
&\min \quad \tilde{\xi}^* \\
&s.t. \begin{cases}
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_1^w,m_1^w,u_1^w)}-(l_{11},m_{11},u_{11})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_2^w,m_2^w,u_2^w)}-(l_{12},m_{12},u_{12})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_3^w,m_3^w,u_3^w)}-(l_{13},m_{13},u_{13})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_4^w,m_4^w,u_4^w)}-(l_{14},m_{14},u_{14})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_5^w,m_5^w,u_5^w)}-(l_{15},m_{15},u_{15})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_6^w,m_6^w,u_6^w)}-(l_{16},m_{16},u_{16})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_7^w,m_7^w,u_7^w)}-(l_{17},m_{17},u_{17})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_8^w,m_8^w,u_8^w)}-(l_{18},m_{18},u_{18})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_9^w,m_9^w,u_9^w)}-(l_{19},m_{19},u_{19})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{110}^w,m_{110}^w,u_{110}^w)}-(l_{110},m_{110},u_{110})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{111}^w,m_{111}^w,u_{111}^w)}-(l_{111},m_{111},u_{111})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{112}^w,m_{112}^w,u_{112}^w)}-(l_{112},m_{112},u_{112})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{113}^w,m_{113}^w,u_{113}^w)}-(l_{113},m_{113},u_{113})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{114}^w,m_{114}^w,u_{114}^w)}-(l_{114},m_{114},u_{114})\right| \le (K^\star,k^\star,k^\star)\\
\left|\dfrac{(l_1^w,m_1^w,u_1^w)}{(l_{115}^w,m_{115}^w,u_{115}^w)}-(l_{115},m_{115},u_{115})\right| \le (K^\star,k^\star,k^\star)
\end{cases}
\end{aligned}
\tag{4.1}
$$

$$
\begin{cases}
\left|\dfrac{(l_1^w, m_1^w, u_1^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{18}, m_{18}, u_{18})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_2^w, m_2^w, u_2^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{28}, m_{28}, u_{28})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_3^w, m_3^w, u_3^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{38}, m_{38}, u_{38})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_4^w, m_4^w, u_4^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{48}, m_{48}, u_{48})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_5^w, m_5^w, u_5^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{58}, m_{58}, u_{58})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_6^w, m_6^w, u_6^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{68}, m_{68}, u_{68})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_7^w, m_7^w, u_7^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{78}, m_{78}, u_{78})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_8^w, m_8^w, u_8^w)}{(l_8^w, m_8^w, u_5^w)} - (l_{88}, m_{88}, u_{88})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_9^w, m_9^w, u_9^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{98}, m_{98}, u_{98})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{10}^w, m_{10}^w, u_{10}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{108}, m_{108}, u_{108})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{11}^w, m_{11}^w, u_{11}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{118}, m_{118}, u_{118})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{12}^w, m_{12}^w, u_{12}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{128}, m_{128}, u_{128})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{13}^w, m_{13}^w, u_{13}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{138}, m_{138}, u_{138})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{14}^w, m_{14}^w, u_{14}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{148}, m_{148}, u_{148})\right| \leq (K^\star, k^\star, k^\star) \\
\left|\dfrac{(l_{15}^w, m_{15}^w, u_{15}^w)}{(l_8^w, m_8^w, u_8^w)} - (l_{158}, m_{158}, u_{158})\right| \leq (K^\star, k^\star, k^\star) \\
\sum\limits_{j=1}^{n} R(\tilde{w}_j) = 1 \\
l_j^w \leq m_j^w \leq u_j^w \\
l_j^w \geq 0 \\
j = 1, 2, \cdots, 15.
\end{cases}
$$

Step 7: By solving Eq. (4.1), the optimal fuzzy weights of ten criteria can be calculated. Furthermore, criterion weights were calculated using Eq. (2.2). Obtained criterion weights values are shown in Table 6.

Table 6: The optimal fuzzy and crisp weights of 10 criteria.

Optimal fuzzy weight	Crisp weight	Optimal fuzzy weight	Crisp weight
$\tilde{w}_1^*$=(0.60,0.63,0.65)	w_1^*=0.63	$\tilde{w}_9^*$=(0.47,0.49,0.50)	w_9^*=0.49
$\tilde{w}_2^*$=(0.49,0.51,0.52)	w_2^*=0.51	$\tilde{w}_{10}^*$=(0.45,0.47,0.48)	w_{10}^*=0.47
$\tilde{w}_3^*$=(0.28,0.30,0.32)	w_3^*=0.30	$\tilde{w}_{11}^*$=(0.16,0.17,0.18)	w_{11}^*=0.17
$\tilde{w}_4^*$=(0.23,0.25,0.28)	w_4^*=0.25	$\tilde{w}_{12}^*$=(0.44,0.45,0.47)	w_{12}^*=0.45
$\tilde{w}_5^*$=(0.58,0.61,0.62)	w_5^*=0.60	$\tilde{w}_{13}^*$=(0.18,0.21,0.23)	w_{13}^*=0.20
$\tilde{w}_6^*$=(0.56,0.57,0.58)	w_6^*=0.57	$\tilde{w}_{14}^*$=(0.38,0.40,0.42)	w_{14}^*=0.40
$\tilde{w}_7^*$=(0.53,0.54,0.56)	w_7^*=0.55	$\tilde{w}_{15}^*$=(0.33,0.35,0.37)	w_{15}^*=0.35
$\tilde{w}_8^*$=(0.09,0.10,0.11)	w_8^*=0.10		

Therefore, it can be seen that reverse fund $\succ$ patronage $\succ$ services $\succ$ Conference $\succ$ online lottery $\succ$ reward $\succ$ production of educational content $\succ$ employment $\succ$ financial interests $\succ$ user benefit $\succ$ online competitions $\succ$

education courses $\succ$ localization $\succ$ welfare sevices $\succ$ membership fee, which is in accordance with the preference order obtained by employing fuzzy BWM.

5 Main results

In this article, a new approach for decision-making and marketing forecast based on fuzzy logic fuzzy expert system is presented regarding the tourism development plan of Majma Hamiyari Association. In other words, let's look at system marketing using the reverse fund design calculation method in attracting different strata according to the input and output variables. In fact, we offer the marketing manager a plan to focus the most time and capital for advertising on the segment where this calculation method has the greatest impact on attracting customers.

This study evaluates and examines the tourism and the revival of the tourism industry during the Majma Hamyari cultural plan. Under these circumstances, the tourism industry must evaluate its core strategies and develop strategies for developing and attracting tourism in the Majma Hamyari cultural plan. For this purpose, in the previous section, in the first step, important factors that can affect the tourism have been identified using best-worst MCDM method. The next step is to identify potential and valuable solutions that can help attract tourism to the Majma Hamyari cultural plan using EDAS method. Six strategies have been considered to attract tourism, which are:
The possibility of transferring the benefits and facilities of plan members to others, or in other words, the possibility of transferring the account of plan members to others (A_1),

Preservation of the interests of plan members, after death and transfer of interests to the heirs (A_2),

The possibility of generating income for members by obtaining virtual brokerage of the plan (A_3),

Providing banking facilities to users (A_4),

Improving the quality and quantity of cultural services and products of cultural industries (A_5),

Establishing an entrepreneurship training workshop for local members of each region (A_6),

Follow-up and contact from the central office of the plan with the users regarding the understanding of the economic problems of the society and providing solutions as well as hope for the future to the user (A_7),

The possibility of establishing a network marketing system for members of the cultural plan of Hamiyari Assembly (A_8),

Forgiveness of bank and insurance late payments if users do not pay membership fees for several months (A_9),

The possibility of transferring members of Hamiyari Assembly's cultural plan to Hamiyari Assembly's tourism development plan (A_{10}).

Based on the opinions of the Committee of Experts, a matrix of collective decision options is presented, the results of which are shown in Table 7.

In the next step, based on this method, the matrices of positive distance from the average PDA and negative distance from the average NDA are determined according to the type of criterion, the results of which are seen in Tables 8 and 9, respectively.

Next, based on the fuzzy EDAS method, the fulfilled score $R(\tilde{as})$ is calculated for all options. Table 10 presents the results of these calculations.

Scores obtained based on the EDAS method were calculated using Eq. (3.15). Obtained rank values are shown in Table 10. Therefore, it can be seen that $A_4 \succ A_1 \succ A_6 \succ A_7 \succ A_2 \succ A_9 \succ A_{10} \succ A_8 \succ A_5 \succ A_3$, which is in accordance with the preference order obtained by employing fuzzy EDAS. Based on the results of this study, providing banking facilities to users (A_4) ranks first among other options for the economy itself.

6 Conclusion

Evaluation based on distance from average solution EDAS, developed in 2015, is one of the well-known and frequently utilized methods which is applied for different types of decision making problems. The output of EDAS is a ranking order of alternatives based on their aggregated distance scores. In this regard, the literature lacks a comprehensive literature review on the developments and applications of EDAS. The tourism sector, like other economic activities, has not been spared from this crisis and has suffered even more than other economic activities. The tourism supply sector of the province is facing major challenges such as loss of income and liquidity of the country and trained manpower, increase in unemployment, etc., so that some activists in the field of tourism were forced

Table 7: The cumulative decision matrix.

X	C_1	C_2	C_3	C_4	C_5
A_1	(1.7,2,5)	(2.9,4.3,6.7)	(1.6,32,4.5)	(1.8,3.3,5.2)	(4.8,5.8,8.2)
A_2	(4.5,6.8,7.9)	(5.5,8.6,9.7)	(3,5,7)	(3.5,4.9,6.3)	(3.3,5.5,7.2)
A_3	(2.5,4.5,6.8)	(1.5,3,5)	(1.9,2.9,4.8)	(3.3,5.3,6.4)	(2.3,4.3,6.2)
A_4	(1.4,3,9.6)	(2.7,3.9,4.8)	(3.2,3.9,5.3)	(1.5,3,5.5)	(5.8,6.3,8.9)
A_5	(4.4,4.6,8)	(3.9,6,8.8)	(12.8,3.6,5.9)	(6.2,8.5,9.8)	(1.4,2.3,4.5)
A_6	(4.1,5.6,7)	(1.5.2,2.6,4.2)	(2.5,4,4.9)	(5.2,6.6,8.5)	(2.2,3.2,4.6)
A_7	(3.1,4.6,6.6)	(2.2,2.8,3.2)	(3.5,4,5)	(5.1,6.7,8.8)	(3.2,4.4,5.6)
A_8	(2.7,5.6,8)	(2.4,3.5,5.2)	(3.5,4,5.9)	(4.2,6.7,7.5)	(3.1,4,4.7)
A_9	(5.6,6.6,8)	(2.3,2.9,4)	(3.3,4,5)	(5,6.6,7.2)	(2.1,3.2,4.6)
A_{10}	(2.1,3,3.3)	(3.6,4,5.4)	(2.2,2.7,3.5)	(1.7,2.5,3)	(4,5,6.6)
W_j	(0.22,0.24,0.0.26)	(0.17,0.19,0.20)	(0.12,0.14,0.15)	(0.08,0.09,0.12)	(0.05,0.06,0.07)
AV	(4.02,5.33,7.05)	(3.20,5.30,6.69)	(3.3,4,5.9)	(1.9,4.3,5.5)	(3.9,5.3,7.1)

X	C_6	C_7	C_8	C_9	C_{10}
A_1	(3,4.8,6.5)	(3.8,4.5,5.5)	(1,2,4.7)	(1.4,3.3,5.5)	(5.3,5.9,7.2)
A_2	(2.4,3.3,5.1)	(3.5,5,6.4)	(2.2,3.9,7)	(3.2,4.3,6.8)	(0.6,1.7,2.8)
A_3	(4.2,6.6,8.2)	(1.6,4,5.4)	(3.3,4.3,5.1)	(0.30,1.1,2.6)	(3.3,4.3,6.2)
A_4	(0.5,1.9,3.2)	(0.7,1.3,3.1)	(6,7.8,8.8)	(1.4,4,5.1)	(1.7,2.5,3.5)
A_5	(4.4,7,8.9)	(5.3,7.5,9)	(1.3,2.5,3.6)	(1.5,2.5,4.6)	(5,6.1,7.8)
A_6	(0.6,1.5,2.5)	(1.5.2,2.6,4.2)	(2.5,4,3.9)	(1.2,2.6,4.5)	(3,3.6,4.5)
A_7	(1,5.1.6,3)	(1.7,2.6,4.4)	(3.5,4,5.1)	(5.2,6.9,9)	(1.9,3.1,5.6)
A_8	(5.6,6.6,7.2)	(2.5,2.9,4)	(5.5,6.5,7.9)	(3.2,5.6,7.5)	(2.2,3.2,4.8)
A_9	(6.8,8.2,9)	(2.9,3.5,5)	(3.5,4,5.9)	(6.1,7,7.9)	(1.2,3.2,4.2)
A_{10}	(0.5,1.2,2)	(1.5.2,2.6,4.2)	(0.6,2,3.9)	(4.2,5.6,7.5)	(1.9,3.2,5.6)
W_j	(0.07,0.09,0.12)	(0.14,0.15,0.16)	(0.32,0.33,0.37)	(0.18,0.22,0.26)	(0.22,0.24,0.27)
AV	(3.5,4.7,6.6)	(2.6,3.9,7)	(3.1,4.9,6.9)	(3,4.6,7.7)	(2.6,3.3,5.5)

X	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
A_1	(0.6,2.8,3.5)	(1.8,3.2,4.9)	(1,2,4.7)	(0.9,2.3,4.6)	(7.2,8,9.3)
A_2	(3.3,3.9,5.3)	(3.5,5,6.6)	(2.4,3.9,7.3)	(2.1,3.1,6.2)	(0.7,1.9,2.5)
A_3	(3.6,65.6,7.1)	(1.5,4.2,5.3)	(3.3,4.4,6.9)	(0.5,2.7,3.9)	(3.5,4.5,6.3)
A_4	(0.5,1.9,4.2)	(1.4,3.3,5.2)	(6,7.9,10)	(2.4,4.4,5.6)	(1.8,2.9,3.9)
A_5	(5.9,8.2,9)	(4.3,6.2,7.9)	(1.3,3.5,4.7)	(2.5,4.3,5.6)	(0.8,1.5,2.5)
A_6	(3.1,3.6,5)	(2.6,4,5.2)	(3.5,4,5.9)	(6,7,8)	(1,2,3)
A_7	(6.6,7,8.7)	(2.5,3.5,4.5)	(1.9,3.6,5)	(5.1,5.9,7.5)	(2.2,3.3,4.6)
A_8	(2.2,3.5,6)	(2.3,2.9,4.1)	(3.5,4,5.3)	(4.1,5.6,7.3)	(2.9,3.2,4.5)
A_9	(4,5.5,6.6)	(7,8,9)	(3,4,4.9)	(6,7,8.8)	(3.3,4.4,5.2)
A_{10}	(5,5.6,6.7)	(3.3,3.9,4.6)	(2,4,5)	(4.4,6.6,7.5)	(3.2,3.9,5)
W_j	(0.07,0.09,0.11)	(0.12,0.15,0.18)	(0.32,0.35,0.38)	(0.40,0.42,0.46)	(0.35,0.37,0.40)
AV	(3.1,4.9,6.9)	(2.9,4.5,6.6)	(4.1,5.3,7)	(4.05,5.30,7.40)	(2.55,3.55,4.55)

Table 8: Positive distances matrix from the average (PDA).

PDA	C_1	C_2	C_3	C_4	C_5
A_1	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_2	(-0.26,0.35,0.85)	(-0.35,0.55,1.56)	(-0.59,0.20,0.50)	(-0.45,0.04,0.75)	(-0.36,0.31,0.56)
A_3	(-0.93,0.05,0.75)	(-0.58,0.42,0.99)	(0.00,0.00,0.00)	(-0.51,0.00,0.07)	(0.00,0.00,0.00)
A_4	(-0.55,0.20,0.50)	(0.00,0.00,0.00)	(-0.05,0.30,0.65)	(-0.38,0.02,0.80)	(0.12,0.65,2.02)
A_5	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.70,0.05,0.97)	(0.00,0.00,0.00)	(-0.18,0.91,99)
A_6	(-0.16,0.51,2.05)	(-0.25,0.31,1.7)	(0.00,0.00,0.00)	(0.25,0.05,0.86)	(0.00,0.00,0.00)
A_7	(-0.15,0.62,1.15)	(-0.28,0.25,1.9)	(0.00,0.00,0.00)	(0.21,0.03,0.59)	(0.00,0.00,0.00)
A_8	(0.00,0.00,0.00)	(-0.33,0.33,1.9)	(0.00,0.00,0.00)	(0.39,0.05,0.99)	(0.00,0.00,0.00)
A_9	(-0.15,0.62,1.15)	(-0.21,0.31,1.6)	(0.00,0.00,0.00)	(0.25,0.06,0.69)	(0.00,0.00,0.00)
A_{10}	(-0.55,0.69,2.03)	(-0.25,0.55,1.69)	(0.00,0.00,0.00)	(0.37,0.45,0.98)	(0.00,0.00,0.00)

PDA	C_6	C_7	C_8	C_9	C_{10}
A_1	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_2	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.82,0.15,1.9)	(0.00,0.00,0.00)	(-0.11,0.15,1.71)
A_3	(-0.55,0.12,0.13)	(0.00,0.00,0.00)	(-0.15,0.45,0.89)	(-0.63,0.35,1.15)	(0.00,0.00,0.00)
A_4	(0.00,0.00,0.00)	(-0.57,0.65,1.36)	(0.00,0.00,0.00)	(-0.26,0.03,1.13)	(0.00,0.00,0.00)
A_5	(-0.31,0.66,1.8)	(-0.13,0.31,0.93)	(-0.05,0.05,0.55)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_6	(0.00,0.00,0.00)	(-0.25,0.04,0.88)	(-0.33,0.05,1.26)	(-0.66,0.25,1.99)	(-0.22,0.46,0.68)
A_7	(0.00,0.00,0.00)	(-0.21,0.04,0.55)	(0.00,0.00,0.00)	(-0.33,0.19,2.12)	(-0.33,0.86,2.33)
A_8	(-0.25,0.55,2.15)	(-0.26,0.06,1.18)	(0.00,0.00,0.00)	(-0.48,0.20,2.25)	(-0.15,0.55,0.88)
A_9	(0.00,0.00,0.00)	(-0.05,0.04,0.58)	(0.00,0.00,0.00)	(-0.47,0.18,1.12)	(-0.22,0.46,0.68)
A_{10}	(-0.23,0.00,0.59)	(-0.12,0.05,0.88)	(0.00,0.00,0.00)	(-0.56,0.25,1.56)	(-0.48,0.55,0.99)

PDA	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
A_1	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_2	(-0.45,0.05,2.25)	(0.00,0.00,0.00)	(-0.80,0.17,2.02)	(0.00,0.00,0.00)	(-0.15,0.15,2.71)
A_3	(-0.60,0.15,0.88)	(0.00,0.00,0.00)	(-0.19,0.55,1.05)	(-0.45,0.55,0.95)	(0.00,0.00,0.00)
A_4	(0.00,0.00,0.00)	(-0.55,0.65,1.36)	(0.00,0.00,0.00)	(-0.25,0.03,0.66)	(0.00,0.00,0.00)
A_5	(-0.31,0.66,1.8)	(-0.11,0.31,0.93)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_6	(0.00,0.00,0.00)	(-0.66,0.05,2.03)	(-0.36,0.88,2.55)	(-0.45,0.17,2.12)	(-0.53,0.46,0.98)
A_7	(-0.26,0.00,0.59)	(-0.23,0.04,0.58)	(0.00,0.00,0.00)	(-0.25,0.10,1.15)	(-0.06,0.02,0.55)
A_8	(0.00,0.00,0.00)	(-0.78,0.05,1.88)	(0.00,0.00,0.00)	(-0.55,0.25,2.23)	(-0.65,0.55,2.35)
A_9	(-0.69,0.05,0.1.56)	(-0.25,0.03,0.99)	(0.00,0.00,0.00)	(-0.66,0.56,1.26)	(-0.33,0.05,0.1.36)
A_{10}	(0.00,0.00,0.00)	(-0.22,0.21,0.85)	(-0.42,0.55,1.36)	(-0.47,0.18,1.12)	(-0.22,0.46,0.68)

Table 9: Negative distances matrix from the average (NDA).

NDA	C_1	C_2	C_3	C_4	C_5
A_1	(-0.16,0.49,2.05)	(-0.72,0.06,0.92)	(-0.55,0.02,0.85)	(-0.55,0.45,1.30)	(-0.62,0.02,0.97)
A_2	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_3	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.66,0.25,1.12)	(-0.40,0.20,0.85)	(-0.52,0.65,1.50)
A_4	(0.00,0.00,0.00)	(-0.45,0.59,2.25)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_5	(-0.44,0.52,0.98)	(-0.42,0.55,0.78)	(0.00,0.00,0.00)	(-0.75,0.33,1.32)	(0.00,0.00,0.00)
A_6	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.65,0.61,2.15)	(0.00,0.00,0.00)	(-0.05,0.02,1.67)
A_7	(0.00,0.00,0.00)	(-0.99,0.05,1.29)	(-0.66,0.67,2.03)	(-0.5,0.00,0.66)	(-0.07,0.22,1.99)
A_8	(-0.33,0.05,0.99)	(0.00,0.00,0.00)	(-0.99,0.30,2.50)	(0.00,0.00,0.00)	(-0.03,0.05,1.55)
A_9	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.45,0.55,1.88)	(0.00,0.00,0.00)	(-0.25,0.05,2.33)
A_{10}	(-0.55,0.05,1.69)	(-0.44,0.50,1.28)	(-0.66,0.76,1.76)	(0.00,0.00,0.00)	(-0.88,0.32,2.15)
NDA	C_6	C_7	C_8	C_9	C_{10}
A_1	(-0.50,0.02,0.78)	(-0.53,0.22,0.58)	(-033,0.18,0.58)	(-0.35,0.66,1.66)	(-0.58,0.35,0.82)
A_2	(-0.19,0.53,1.07)	(-0.43,0.05,0.88)	(0.00,0.00,0.00)	(-0.43,0.62,1.62)	(0.00,0.00,0.00)
A_3	(0.00,0.00,0.00)	(-0.46,0.33,1.62)	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.65,0.06,0.95)
A_4	(-0.45,0.54,0.83)	(0.00,0.00,0.00)	(-0.65,0.05,1.33)	(0.00,0.00,0.00)	(-0.49,0.44,0.99)
A_5	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.25,0.16,0.72)	(-0.57,0.83,2.55)	(-0.22,0.08,2.16)
A_6	(-0.28,0.50,0.98)	(0.00,0.00,0.00)	(-0.67,0.45,1.30)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_7	(-0.30,0.40,2.25)	(-0.56,0.05,0.65)	(-0.99,0.65,1.55)	(-0.88,0.66,1.44)	(0.00,0.00,0.00)
A_8	(-0.08,0.50,0.88)	(0.00,0.00,0.00)	(-0.77,0.66,0.55)	(-0.28,0.08,1.55)	(0.00,0.00,0.00)
A_9	(-0.26,0.40,1.23)	(-0.22,0.05,0.55)	(-0.55,0.55,0.66)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_{10}	(-0.55,0.55,2.55)	(0.00,0.00,0.00)	(-0.23,0.34,1.40)	(0.00,0.00,0.00)	(-0.99,0.25,2.66)
NDA	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}
A_1	(-0.50,0.33,1.25)	(-0.25,0.22,2.25)	(-0.35,0.19,2.02)	(-0.36,0.07,0.89)	(-0.58,0.35,0.82)
A_2	(-0.25,0.55,1.57)	(-0.66,0.25,0.96)	(0.00,0.00,0.00)	(-0.45,0.52,1.16)	(0.00,0.00,0.00)
A_3	(0.00,0.00,0.00)	(-0.32,0.03,1.56)	(0.00,0.00,0.00)	(-0.23,0.02,0.88)	(-0.57,0.07,0.85)
A_4	(-0.35,0.45,0.83)	(0.00,0.00,0.00)	(-0.44,0.66,1.39)	(0.00,0.00,0.00)	(-0.09,0.34,1.05)
A_5	(0.00,0.00,0.00)	(0.00,0.00,0.00)	(-0.35,0.17,0.80)	(-0.36,0.26,1.89)	(-0.13,0.08,1.19)
A_6	(-0.05,0.55,1.20)	(0.00,0.00,0.00)	(-0.56,0.35,1.33)	(0.00,0.00,0.00)	(0.00,0.00,0.00)
A_7	(-0.99,0.10,1.35)	(0.00,0.00,0.00)	(-0.56,0.55,2.30)	(0.00,0.00,0.00)	(-0.05,0.08,0.66)
A_8	(-0.19,0.50,0.99)	(-0.35,0.08,1.88)	(-0.23,0.33,2.30)	(-0.88,0.44,0.56)	(0.00,0.00,0.00)
A_9	(-0.25,0.36,2.36)	(0.00,0.00,0.00)	(-0.06,0.05,1.28)	(0.00,0.00,0.00)	(-0.88,0.35,1.55)
A_{10}	(-0.15,0.05,0.78)	(0.00,0.00,0.00)	(-0.99,0.66,2.55)	(0.00,0.00,0.00)	(-0.88,0.25,1.73)

Table 10: Scores obtained based on the EDAS method.

NDA	$\tilde{as} = (l, m, u)$	$R(\tilde{as})$	Ranking
A_1	(-0.51,0.79,2.21)	0.80	2
A_2	(-0.86,0.67,1.80)	0.67	5
A_3	(-0.94,0.42,1.28)	0.40	10
A_4	(-0.57,0.84,2.00)	0.85	1
A_5	(-0.99,0.44,1.39)	0.45	9
A_6	(-0.55,0.74,1.72)	0.75	3
A_7	(-0.75,0.75,1.92)	0.73	4
A_8	(-0.87,0.52,1.42)	0.50	8
A_9	(-0.65,0.62,1.69)	0.60	6
A_{10}	(-0.47,0.57,1.02)	0.55	7

to stop their activities. Therefore, in this paper, a MCDM for attracting tourism in the tourism industry of the province in the face of the crisis caused by the outbreak of Majma Hamyari cultural plan was presented. Based on the proposed framework, first, by studying the research literature extensively, effective indicators in attracting tourism were identified, then the weights of these indicators were calculated using the new method of best-worst fuzzy. Also, in the results section, the fuzzy EDAS technique is shown as a new MCDM in order to determine the ranking of effective factors in the tourism industry. The results of this model provide valuable principles for tourism managers and experts to select effective and useful indicators. Due to the results of this study, providing Banking facilities to users ranks (A_4) ranks first among other options for the economy itself.

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